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Incremental gains achievable within poultry nutrition

Feed manufacturers are becoming more aware of so-called "extra-phosphoric effects" from the complete breakdown of phytate in the diet.

By **TIAGO TEDESCHI DOS SANTOS***

AGAINST the backdrop of increasing consumer pressure, poultry producers are looking to get the most value out of their operations.

Considerable time and effort are spent evaluating products, suppliers and different applications to remain competitive. Nutritionists play a key role in this process and have to be highly technical in order to determine these differences when incremental gains become more important to the success of their companies.

Science has a role to play in identifying incremental gains that otherwise may not be realized. Scientific advancements within the field of nutrition and technology can take several forms:

- An improved understanding of the physiological processes within poultry;
- A greater understanding of how to extract more insight from analytical methods that are employed throughout the feed production process, e.g., analyses of raw materials and feed production, and
- Research within product areas to better understand the mode of action, enabling further optimization of product application.

Regardless of which form such advancements take, the collective insight gained can provide producers with a different perspective or "feed intelligence" to help fine-tune the nutritional approach employed. This may lead to formulating diets to better meet nutritional requirements, which can result in fewer nutrients being wasted. This can also lead to fewer broiler production problems, resulting in better performance at a lower cost.

The aggregation of these incremental gains is what provides companies with a competitive edge and enables them to remain profitable in today's market climate.

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More targeted approach

Across the feed industry, companies are looking to be more targeted with their nutritional approach, and this is set to continue, given the changes taking place within the global marketplace. An example is how they apply feed enzymes — particularly phytase.

The phytase sector has seen substantial growth over the past 10 years. Worldwide, a phytase is added to most poultry feeds (roughly 90%) to improve feed efficiency, and in general, there is a trend toward higher usage per ton treated.

The benefits of using a phytase come from both the dose applied and the use of a product that is optimized for phytate breakdown.

Evolution of phytase use

As the dose of a phytase with high phytate-binding affinity increases, it is possible to almost eliminate the anti-nutritional effect of phytate and release significant amounts of dietary inositol for the animal (Figure 1).

Inositol plays a key role in several functions, including cell survival and growth, central nervous system development and function, bone structure and formation, oxygen transportation and general metabolism and reproduction.

Maximum phytate breakdown leads to a lower phytate concentration in the gut, thus reducing the chelation effect of this molecule with calcium and other minerals such as zinc, iron and copper. It also leads to higher protein solubility and improves amino acid digestibility and absorption, lowers energy and nutrient losses and increases phosphorus absorption.

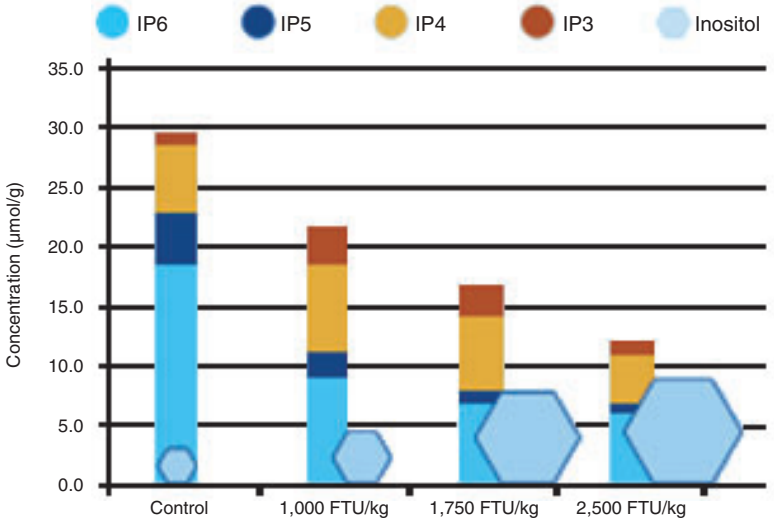
All of these nutrient aspects can be considered in feed formulation programs to generate feed cost savings while maintaining performance, leading to more sustainable production.

Traditionally, phytase was used to release phosphorus; however, feed manufacturers are now much more aware of these so-called "extra-phosphoric effects" from the complete breakdown of the phytate in the diet. In order to get these benefits, it becomes even more important to know the total phytate concentration of the diet.

Understanding phytate levels

Phytate, which is present in all plant-

1. Phytate and lower esters reduced with increasing dose



Note: Phytase with a high binding affinity to phytate breaks down phytate (IP6) and its lower esters as the dose increases and subsequently releases inositol and valuable nutrients impaired by or bound to phytate.

Source: Holloway et al. (2016); results from three experiments in grower/finisher pigs.

based feedstuffs, binds with both proteins and minerals (especially calcium) in the gastrointestinal tract, subsequently reducing digestibility and utilization of important nutrients. The level of phytate varies within raw materials (Figure 2), and this will lead to variable phytate content of complete feeds.

So, understanding the phytate level can help nutritionists optimize phytase dosages without risking performance losses or welfare problems.

Incremental gains

The ability to determine the level of phytate in ingredients and feed by near-infrared spectroscopy (NIR) is, thus, relevant as it helps identify the phytase application that can deliver the best return on investment. NIR gives nutritionists confidence that there is sufficient substrate on which a phytase can act.

On the other hand, if higher levels of dietary phytate are detected, producers can use higher doses of an efficient phytase to increase phosphate availability and reduce the anti-nutritive effects of phytate more effectively. This allows producers to tap into incremental gains that may otherwise have been lost or not realized.

The phytase application that delivers the greatest return may vary across regions and among companies, and the benefits can range from looking for improved performance to greater feed cost savings.

To aid in the nutritional program, NIR technology can be used to determine phytate levels built off a large and robust database from different parts of the world to ensure a reliable prediction. NIR enables the rapid analysis of a large volume of feedstuff samples at a low cost.

Conclusions

Incremental gains using a phytase with a high binding affinity to phytate can come from either improved performance or reduced feed cost, depending on production goals.

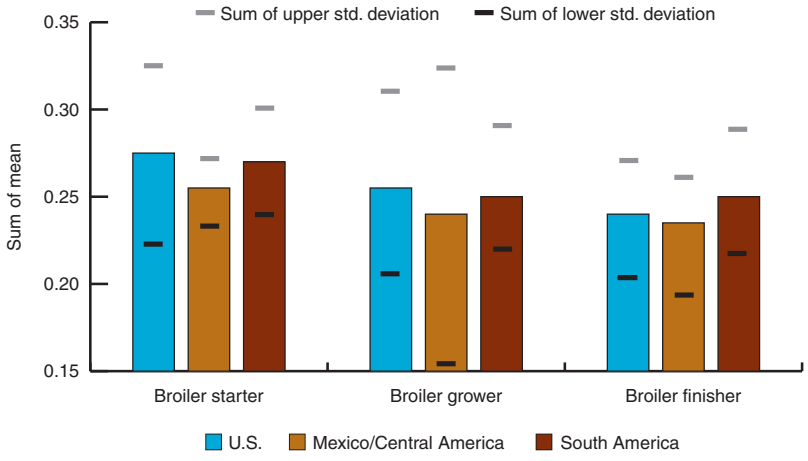
Performance benefits can be achieved by applying more than 1,500 phytase units (FTU) per kilogram on top of a standard broiler diet (using a mineral matrix at 500 FTU/kg) with a typical four-point improvement in feed conversion ratio at market. Or, using the same phytase that can deliver consistent nutrient availability from maximum phytate breakdown offers the potential to reduce feed costs by as much as $20 per ton, depending on the feed formulation.

Phytate is an important anti-nutrient present in all plant-based ingredients and affects animal performance. Inclusion of a phytase with a high binding affinity for phytate can reduce the concentration of phytate in the gut, thus releasing phosphorus and other dietary nutrients and leading to a significant release of inositol, which can improve animal performance or help reduce feed costs.

In order to explore the potential feed cost savings and/or performance improvement, it is important to understand and evaluate the phytate concentration in feeds. As the phytate concentration in the gut is reduced, releasing nutritional benefits, it is also important to ensure that the phytase chosen maintains its efficiency even when the phytate concentration is low and — possibly more important — when the phytase needs to break down the phytate-esters that form during the hydrolysis process.

Only by determining all of these aspects will it be possible to obtain incremental gains. Whether it's from improved performance or reduced feed costs, they ultimately lead to more efficient and sustainable animal production. ■

2. Phytic-phosphorus levels in broiler diets from the U.S., Mexico and Central America and South America



Note: A total of around 16,000 samples were analyzed.